A Work Project, presented as part of the requirements for the Award of a Master Degree in Finance from the NOVA – School of Business and Economics.

SOLAREDGE TECHNOLOGIES, INC.
EQUITY RESEARCH

CAPABILITIES FAR BEYOND
INVERTER TECHNOLOGY

MATTES HOLM
40581

A Project carried out on the Master in Finance Program, under the supervision of:

Professor Rosário André

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Abstract
This equity research values SolarEdge Technologies, Inc. and analyzes if SolarEdge can maintain its market position in a strong growing solar energy industry that recently dropped to a competitive price. The revenue forecast is based on a gigawatt shipped metrics that evaluates the company's revenue streams on a geographical and segmental level, while analyzing the revenues from the recent acquisitions. Additionally, the report evaluates SolarEdge's capabilities beyond its core business. An analysis of the competitive environment helps determine the expected future market shares of the company. Furthermore, effects of decreasing prices, softening of subsidies, trade wars, and technological advancement are analyzed. Finally, the analysis concludes with a "BUY" recommendation. The target stock price is $409.37, and the current price is $319.12, leading to an expected return of 28.33%.

Keywords: SolarEdge, revenues forecast, solar energy, acquisitions

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This report is part of the SolarEdge Technologies, Inc. Equity Research report (annexed) and should be read has an integral part of it.

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Company Overview

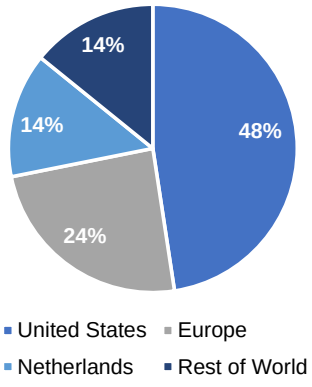
Company Description

SolarEdge Technologies, Inc. is an Israeli based company established in 2006, which pioneered the photovoltaic (PV) inverter industry through its inverter solution. With over 2,400 employees and installations in more than 130 countries, SolarEdge is the global leading PV inverter manufacturer with 19.5 GW of systems shipped worldwide and $1.26B revenues from its DC optimized inverter.

The company has a wide geographic reach, while its revenues are strongly focused. Almost half of SolarEdge's revenues come from U.S. customers and around 38% come from Europe (Exhibit 1). However, the rest of world (RoW) accounts for more than 69%[1] of new PV installations in 2019. Therefore, the addressable PV inverter market of $9.1B[2] offers growth opportunities that will be analyzed throughout this report. To supply these geographical regions, SolarEdge is following a production outsourcing strategy. Two global electronics manufacturing service providers, Jabil Circuit and Flex, produce SolarEdge's inverter solution in China, Vietnam, and Hungary. This strategy allows SolarEdge to have access to advanced manufacturing equipment, while only bearing capex expenditures for end-of-line testing equipment. The distribution of the product is done solely through shipping.

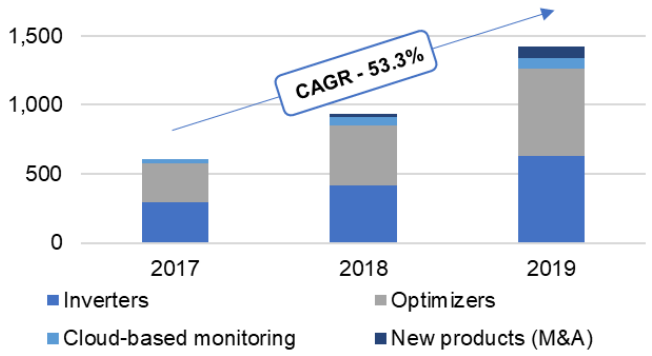
Throughout the past three years, SolarEdge has been growing at a CAGR of 53.3% in revenues of which its solar segment (incl. inverters, optimizers, and cloud-based monitoring systems) grew at 48.4% (Exhibit 2). The additional growth came from the company's M&A activities in 2018 and 2019.

Exhibit 1: Revenues by Geography, 2019 (%)



Source: Company reports

Exhibit 2: Revenue growth by product ($M)



Source: Company reports

Exhibit 3: M&A history

Date	Company	Business area	Type	Price
07/2018	**Gamatronic**	Development, manufacturing and sale of UPS	Assets	$13.1M
10/2018	**Kokam**	Lithium-ion cells, batteries and energy storage solution	Equity	$103.5M
01/2019	**SMRE**	Innovative integrated powertrain technology and electronics	Equity	$140M

Source: Company reports, press releases

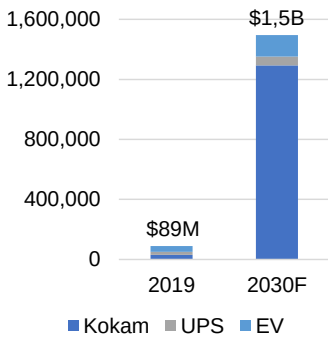
M&A Activity

Through strategic acquisitions on track towards a complete product portfolio in the photovoltaic sector

The company is constantly expanding its product portfolio, especially through M&A activities (Exhibit 3). In 2018 and 2019, SolarEdge acquired Gamatronic Electronic Ltd.'s (Gamatronic), Kokam Co., Ltd. (Kokam), and S.M.R.E. Spa (SMRE). These acquisitions enabled SolarEdge to expand its products by adding energy storage systems, uninterruptible power source (UPS), and electric vehicle (EV) solutions. SolarEdge acquired all companies through cash and has built up a cash position of over one billion dollars in Q3 of 2020, for possible further acquisitions as the company announced in a recent webcast. The expected revenue development from recent

[1] Source: IHS Markit
[2] Source: IHS Markit

Exhibit 4: Revenues from acquisitions (in $T)



Source: Company reports, analyst estimates

acquisitions is shown in exhibit 4.

The Gamatronic acquisition in 2018 was a pure asset purchase in order to continue to expand SolarEdge's already existent UPS business. SolarEdge expects its UPS business to become profitable in 2022 (Exhibit 5).

Exhibit 5: Expected profitability of acquisitions

	Expected Profitability
Kokam	2020
UPS	2022
EV	2022

Source: Analyst day presentation

The acquisition of Kokam in 2018 was a move towards adding energy storage into the PV ecosystem of SolarEdge. The company is based in South Korea and gives SolarEdge access to new markets. SolarEdge is planning to expand its inverter business especially towards the utility segment, which requires large capacity energy storage that Kokam can provide and continue to develop. The current factory expansion of $80-90M aims to boost the capacity of production to 2GWh and shows SolarEdge's strong interest in the energy storage business. The following analysis in exhibit 6 shows clearly that Kokam is expected to bring by far the largest value to SolarEdge, while the independency of the UPS and EV businesses do not allow SolarEdge to add significant value.

Exhibit 6: Acquisition analysis, effect on share price

	Current share price	Kokam	UPS	EV
Share price excl. business	$369.97	$316.81	$366.26	$367.18
Share price loss	$0.00	$53.16	$3.71	$2.79
Market cap loss	$0M	$2,664M	$186M	$140M

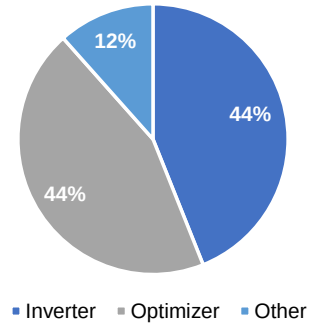
Source: Analyst estimates

The most recent acquisition of SMRE, an Italian producer of powertrain technology for EV, is outside of SolarEdge's main business. This acquisition gives SolarEdge access to the large and strongly growing EV market. However, unlike the Kokam acquisition, the little synergies with SolarEdge's core business make it difficult to add value to this acquisition. For this business segment SolarEdge also expects profitability in 2022 (Exhibit 5).

Pioneering Inverter Technology

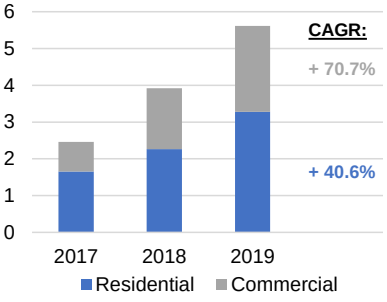
The main product is the DC optimized inverter, which represents 88% of SolarEdge's return in 2019 (Exhibit 7). The technology consists of power optimizers, attached to each solar module that, through sensors, measure the individual efficiency levels by tracking the maximum power point (MPP). The inverter component of the technology is a centralized installation that transforms the electricity from DC to AC and communicates with the power optimizers to increase the MPP for each module. SolarEdge produces the most efficient inverters in the market (see peer companies, Exhibit 19). Furthermore, the company promises its customers high reliability with a warrant of twelve years. Finally, the technology is scalable, thanks to the individually installed optimizers which are operated by a single inverter that comes in different capacities.

Exhibit 7: Revenues by product, 2019 (%)



Source: Company reports

Exhibit 8: Shipped GW by segment



Source: Company reports, analyst estimates

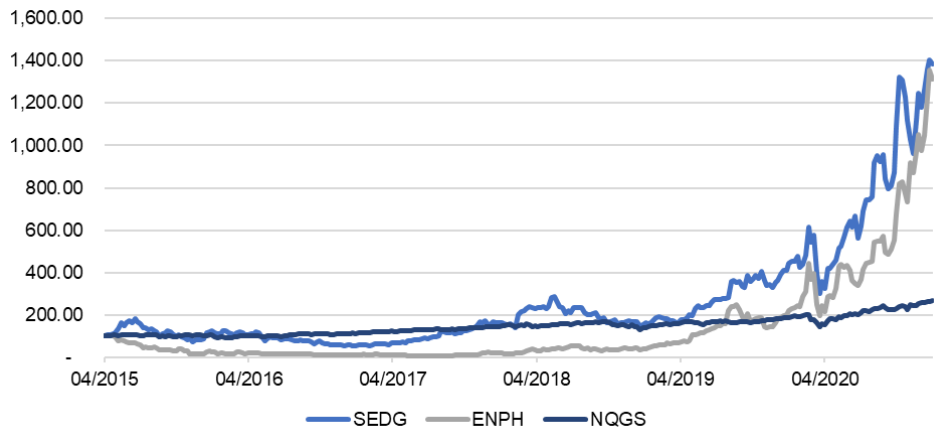
The residential segment is the largest for shipped GW, compromising 58.4% in 2019. However, the commercial segment includes installations for businesses, as well as utility installations that, throughout the past three years, grew on average 70.7%, compared to 40.6% in the residential

segment (Exhibit 8). This development also corresponds to the company's product portfolio, which is complete in the residential segment and expanding in the commercial one. Products in the residential segment include, apart from its inverter business, also solutions such as energy storage, EV charging, data management, and most recently the development of smart modules. Looking forward, the management set clear goals of expanding towards a complete portfolio in the commercial area, as well as advancing their inverter technology, energy storage solutions, and grid management capabilities for the utility sector. This development is already in motion as seen by the strong growth in the commercial segment.

Share Performance

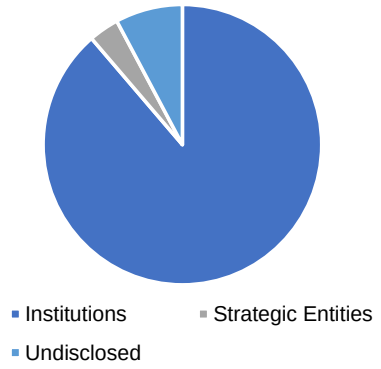
SolarEdge's initial public offering was on March 31, 2015 and its common stock is listed on the NASDAQ Global Select Index (NQGS) as SEDG. The stock has shown significant growth since 2019. After the stock market crash in March 2020, dropping to $67.02, the stock has recovered impressively, jumping up to a high of $324.09 shortly before the holidays (Exhibit 9). The recent drop in early November was due to a shortfall of the earnings release, which shortly after recovered due to high earnings growth expectations by several analysts, including J.P. Morgan, in the coming years. Currently, the stock is at $319.12, only slightly ahead in performance since 2015 of its close competitor Enphase Energy (Enphase). Overall, the stock shows strong resistance to the Corona crisis. Since beginning 2019, SolarEdge and Enphase are gaining from the booming PV market, thanks to many new sustainability targets of countries, especially in context with the Paris Agreement. However, the uncertainty about future subsidies, technological developments, and trade wars causes some fluctuation in the solar energy market.

Exhibit 9: Indexed share performance against Enphase and NQGS



Source: Eikon

Exhibit 10: Ownership, 2020 (%)



Source: Company reports, press releases

Shareholder Structure

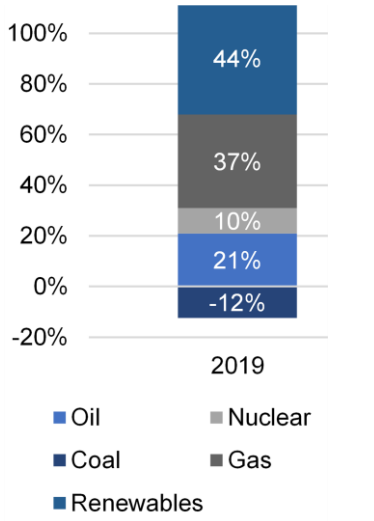
The ownership of SolarEdge is very fragmented. The largest three shareholders own 22.25% of the company and include BlackRock, Fidelity, and Swedbank. 88.7% of shareholders are institutions, 3.5% are strategic holdings, leaving the remaining undisclosed (Exhibit 10). SolarEdge does not pay dividends.

Industry Overview

Sector Analysis

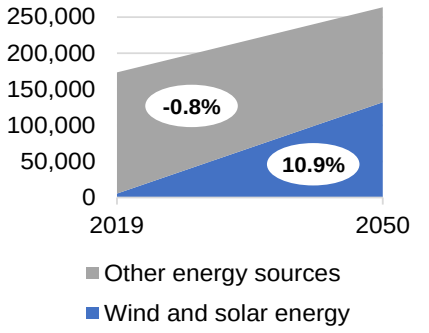
SolarEdge belongs to the energy sector and is part of the renewable energies industry, which includes on- and offshore wind, solar, hydro, bio, as well as other renewable energy sources. In 2019, the increase in energy consumption was led by renewables with 44% (Exhibit 11). Currently, solar and wind energy are responsible for more than half of new power generation. According to McKinsey forecasts, by 2050 more than half of the global energy production will come from solar and wind energy[3]. However, in 2019, the two accounted for only 3.1% of consumed energy. According to the U.S. Energy Information Administration (EIA), the global energy consumption will surpass 900 QBtu by 2050, which corresponds to 263,700 TWh of global energy demand in 2050. Conclusively, if solar and wind energy make up for half of consumed energy in 2050, the two sources of energy will grow on average by 10.9% until 2050 (Exhibit 12).

Exhibit 11: Energy consumption change globally, 2019 (%)



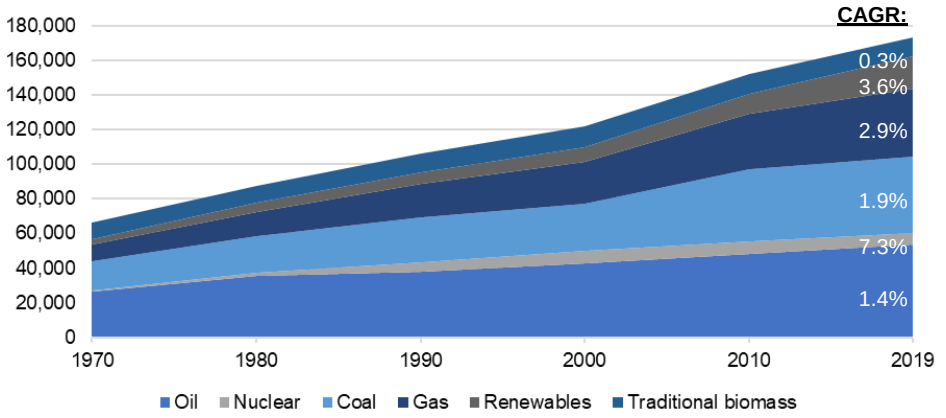
Source: Our World in Data - Energy

Exhibit 12: Energy consumption outlook 2050 (in TWh & CAGR)



Source: Our World in Data - Energy, EIA, Analyst estimates

Exhibit 13: Global energy consumption evolution by sources, from 1970 (in TWh)



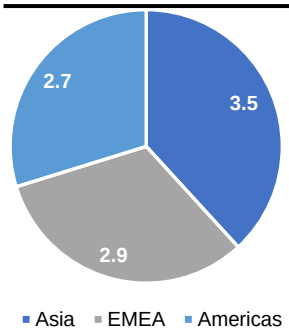
Source: Our World in Data - Energy

Considering the evolution of energy sources (Exhibit 13), the growth in renewables was offset by the slow and consistent growth in hydro energy, which accounts for more than half of the renewable energy consumption in 2019. In comparison, solar and wind grew since 2000 by 40% and 21.5%, respectively, whereas the fossil fuels grew at a maximum of 2.6% and nuclear energy even had a negative development. Furthermore, coal has peaked in 2014 and according to McKinsey, also oil and gas will peak as an energy source before 2038. Therefore, solar energy has a positive outlook for the next decades.

The Photovoltaic (PV) industry has shown strong consistent growth throughout recent years. Despite the Corona crisis, the PV market is expected to grow by 8.1% from a current market size of $76.6B to reach $113.1B bn by 2025, slightly lower (Exhibit 14), the growth in the PV inverter market, which is expected to grow at a rate of 5.6% until 2027 and almost touch $13B. The PV inverter market has reached a record of 19% growth of shipments in GW for 2019, exceeding the

[3] Source: McKinsey & Company - *Global Energy Perspective 2019*

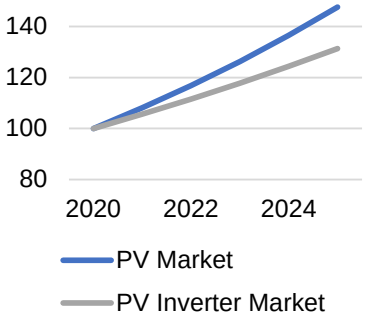
Exhibit 15: Global PV inverter revenue by region, 2019 ($B)



Source: IHS Markit

$9B mark with Asia slightly ahead on a geographical level (Exhibit 15). The discrepancy between the historical growth and the forecast one is caused by high uncertainty in the markets through the Corona crisis, which caused the residential demand for PV to reduce dramatically (as discussed later in this report), but also through unpredictability of subsidies and trade tariffs.

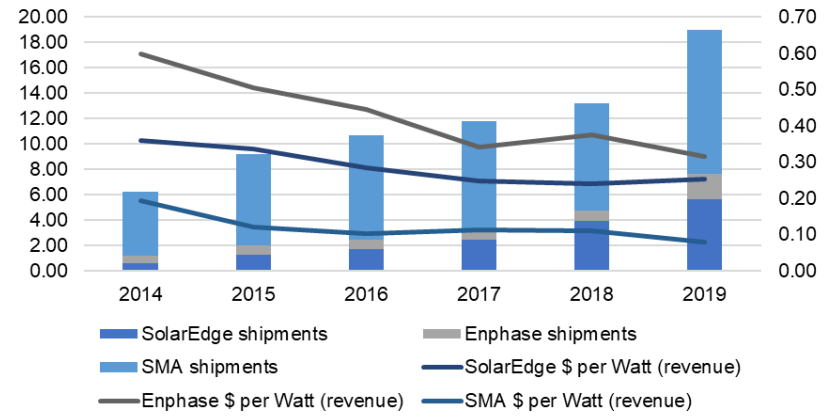
Exhibit 14: PV vs PV inverter market (indexed)



Source: Grand View Research; MarketsandMarkets

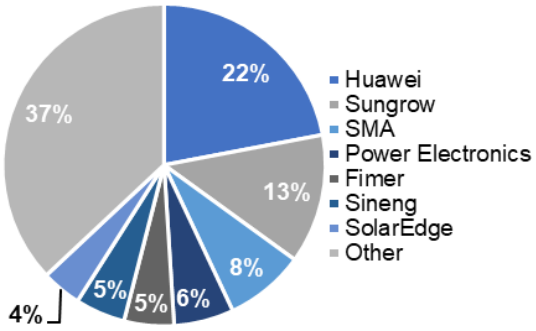
Another trend is the decreasing price of PV inverters. The technology is becoming cheaper causing the demand to increase. Looking at SolarEdge and two of its main competitors, Enphase and SMA Solar Technologies (SMA), an increase in shipped GW can clearly be seen, while revenues per Watt decrease (Exhibit 16). The average shipments increase is 34.5%, whereas the price is decreasing on average by 10.5%. Therefore, a high price elasticity of 3.2 can be observed, meaning that every change in price has an even stronger effect on the quantity shipped.

Exhibit 16: SolarEdge, Enphase, and SMA: Shipped GWs vs Price as $ of revenue per Watt



Source: Company reports, press releases

Exhibit 17: Global PV inverter shipments, 2019 (MW)



Source: Wood Mackenzie

The sector is relatively consolidated with the top four suppliers accounting for almost half of global PV inverter shipments (Exhibit 17). Furthermore, there are various inverters with different technologies: central, string, micro, and others. Throughout the past, traditional central and string inverters were used for harvesting energy. However, the technology became outdated, due to several challenges and inefficiencies, such as flexibility. This means that each module requires the same angle to the sun, each string the same length to the inverter, and the entire installation free of shading. Since the installation of traditional string inverters runs at the efficiency level of the weakest module, it would otherwise dramatically reduce the efficiency. SolarEdge reports to have reduced these energy losses with its DC optimized inverter solution by 33-50%[4], by allowing a better management of solar panels through individual monitoring and optimizing of the energy retrieval of solar panels. Microinverters are produced to tackle many of these issues but also come at a higher price and with a harder maintenance. They are deployed rather in the residential area than in larger solar installations.

Peer Companies

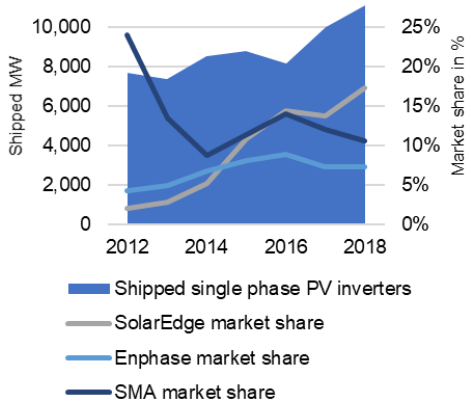
The larger players of the past are being pressured by new players that bring new technologies to

[4] Source: Company website

the market and aggressively win market share from the original companies, taking advantage of the technological development of the industry. Although SolarEdge is behind on a shipped GW ranking, the company leads the ranking in PV inverter revenues[5], followed by SMA, Huawei, and Enphase. This difference comes from a more premium and therefore more expensive product, as well as the weaker presence in the utility sector, which has a lower price of inverters compared to the capacity.

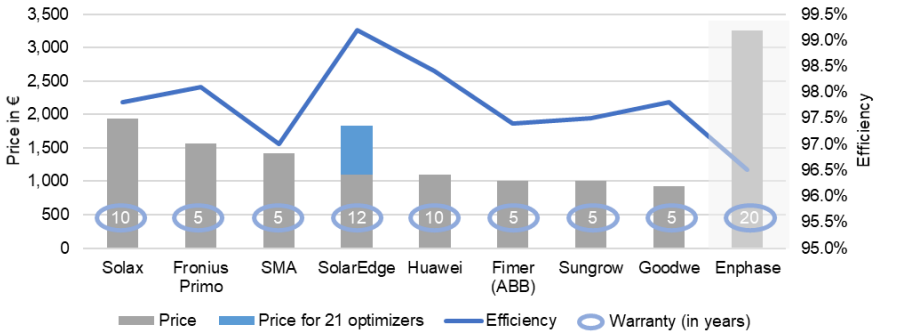
SolarEdge's main competitors and closest rivals are Enphase and SMA. Enphase produces microinverters and belongs to the new companies that are taking away market share from more established companies like SMA, which produces regular PV inverters. The market for single phased inverters grew on average 6.4% from 2012-2018, while SolarEdge grew its market share by 43.3% and Enphase by 9%, SMA lost on average 12.9% (Exhibit 18).

Exhibit 18: Global single-phase PV inverter market size and share



Source: IHS Markit

Exhibit 19: Single-phase inverter comparison, price vs efficiency vs warranty



Source: ALMA SOLAR, company reports, analyst estimates

Exhibit 19 is a comparison of similar single-phase inverters with an AC power output of around 5 KW. The addition of Enphase as a microinverter producer, is based on an installation of 21 modules that correspond to 21 microinverters and 5.04 KW. The additional price for SolarEdge is also based on the price of DC power optimizers for 21 modules. All other inverters only have two MPP trackers, which can substantially reduce the efficiency of harvesting the energy.

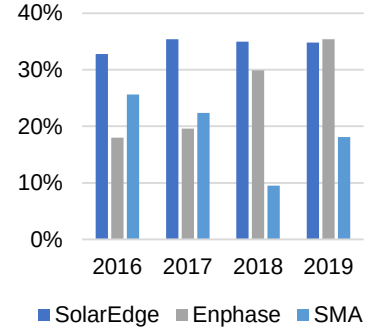
Comparing the inverters in exhibit 19, a competitive advantage can be observed of SolarEdge in terms of efficiency and warranty (excl. Enphase). The average price lies by 1,255€ (excl. Enphase and additional optimizers for SolarEdge). Moreover, to achieve a ranking including all these factors, the price was divided by the warranty and multiplied by one minus efficiency, therefore indicating that the lower the value the better the product (Exhibit 20). SolarEdge is leading the ranking, closely followed by Huawei. Enphase, however, is trailing far behind the two, due to the high price and low efficiency.

Exhibit 20: Ranking (Exhibit 19)

Company	Price / Warranty * (1-Efficiency)
SolarEdge	1.22
Huawei	1.75
Goodwe	4.05
Solax	4.27
Sungrow	5.00
Fimer (ABB)	5.25
Enphase	5.70
Fronius Primo	5.93
SMA	8.52

Source: Analyst estimates

Exhibit 21: Gross Margins



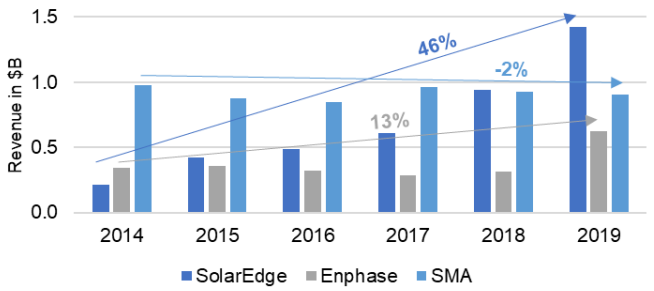
Source: Company reports

Taking a closer look at the financials of the three companies, it can be seen that SolarEdge maintained a stable gross

[5] Source: IHS PV Inverter Market tracker 2019

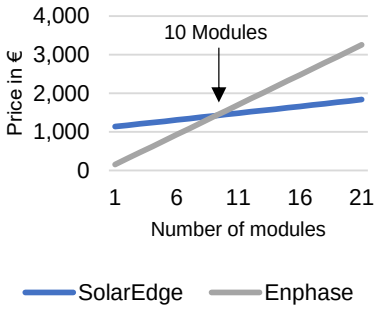
margin above its competitors, while Enphase grew its margin from 18% in 2016 to 35% in 2019 (Exhibit 21). In Q2 of 2020, the company reported a gross margin almost touching 40%. The company was facing financial struggles a few years ago, due to its cost intensive product, but managed very well to cut its cost and boost its gross margin, now even slightly ahead of SolarEdge. Regarding SMA, the company has struggled to maintain its market share as seen in exhibit 18. The technological development in the market has challenged SMA to keep up, while cutting the company's margin. Also, regarding revenues, SMA has experienced an average decrease since 2014, while SolarEdge leads the growth with 46% (Exhibit 22).

Exhibit 22: Revenue growth (in $B)



Source: ALMA SOLAR, company reports, analyst estimates

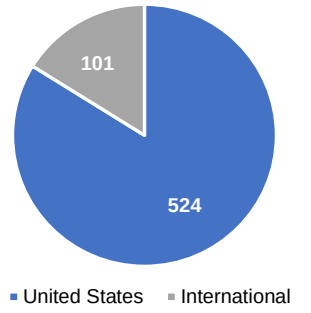
Exhibit 23: Price comparison of inverters, break-even



Source: Analyst estimates

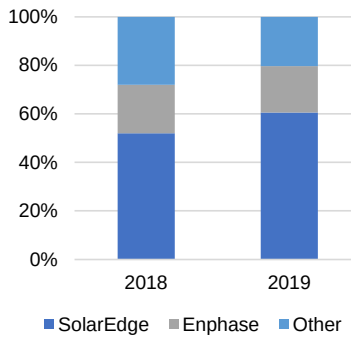
Taking a closer look at Enphase, the company has a very similar product portfolio in the residential segment, consisting of microinverters, storage system, smart management solution, and grid network solutions. The company is mainly focused on the residential sector but has announced to also move further towards the commercial sector. However, Enphase's product, the microinverter, is made more for smaller PV installations, which gives SolarEdge a strong competitive advantage by planning to expand stronger into the commercial and utility segments. Enphase's microinverters are installed on each module, similar to SolarEdge's power optimizers. By calculating the break-even, it can be seen that for installations of 10 modules or more, SolarEdge provides the cheaper solution (Exhibit 23), disregarding the higher efficiency of SolarEdge and the longer warranty of Enphase. Furthermore, Enphase is the closest competitor of SolarEdge in the U.S.. The majority of Enphase's revenues are domestic (Exhibit 24) and together, both companies have a market share of 80% in 2019 (Exhibit 25). The increasing tariffs on U.S. imports have also affected Enphase, as the company also produces its inverters in Asia. While Enphase was struggling with shortages of its products, SolarEdge gained from this development by increasing its prices in the U.S. market to compensate for the higher costs in 2019. This resulted in an increase of SolarEdge's market share by 16.3%, while taking from Enphase that lost 4% (Exhibit 25). However, this effect is countered in 2020, as Enphase reported growth rates about twice[6] as high as SolarEdge in the U.S.. On the other hand, SolarEdge focused its growth on other regions.

Exhibit 24: Enphase Revenue by Geography, 2019 ($M)



Source: Company reports

Exhibit 25: U.S. residential market share



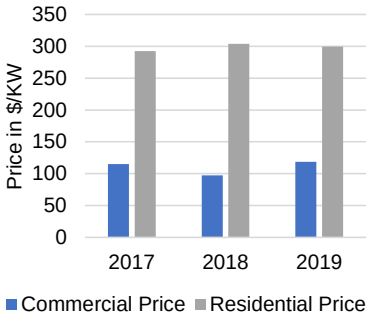
Source: Company reports, Greentech Media, analyst estimates

A fourth considerable competitor is Huawei. Huawei has been involved in several legal disputes with SolarEdge about patent infringement. In the end of 2019, SolarEdge claimed that Huawei has copied the DC power optimizers and violated the company's patents. However, the court

[6] Source: YCharts

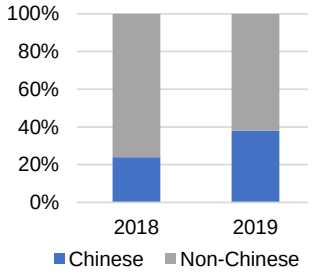
ruled in favor of Huawei[7]. The DC power optimizer was a unique feature of SolarEdge's inverter technology and has brought Huawei a lot closer to the efficiency levels of SolarEdge (99.2% and 98.4%). Although, Huawei is blocked from the US market, due to the trade war with China, the company has pushed stronger into the European market with more than 30% market share for three-phase utility inverters[8] in the U.K. and in Germany. The utility segment has become a big opportunity for Huawei, because other PV inverter companies are still developing their product portfolio for this segment, as it is difficult to serve the large capacities that are required. This has placed Huawei in the lead by shipped MW, compared to its competition. However, the utility segment is not the most lucrative. Exhibit 26 shows that the prices in the residential segment are up to three times as expensive, which has to do with the higher effort required for many smaller installations, meaning that one 100 KW inverter in the commercial segment compares to 20 5 KW inverters in the residential segment. Furthermore, an analysis by Lazard[9] shows that residential PV prices are on average more than five times higher than utility prices. Therefore, regarding the revenues, SolarEdge with its strong residential business is more than 58%[10] ahead of Huawei in 2019 globally.

Exhibit 26: DC optimized inverter price by segment



Source: Company reports, analyst estimates

Exhibit 27: Global market share of Chinese suppliers



Source: IHS Markit

A strong uprise is coming from the slowing Chinese market. Especially Chinese suppliers are increasing their market share internationally to 38 percent in 2019 (Exhibit 27), which shows that also outside of China, the acceptance of Chinese products is high. The companies are making remarkable investments to compete with the foreign market requirements. According to IHS Markit (2020), suppliers such as Ginlong and Sineng even issued IPOs for further funds to fire up their expansion. These companies see opportunities in the utility segment that demands inverter technologies with incredibly high capacity exceeding 200 kW.

Overall, the competitive environment is experiencing changes through technological developments, increased competition, price pressure, trade war, and reduction of subsidies. New companies are challenging the more established ones with innovation and aggressively gaining market share. The market offers many growth opportunities.

Beyond Inverter Technology

SolarEdge is expanding its product portfolio towards new areas, as a plan to increase its average revenue per installation (ARPI), as well as going beyond its original inverter business and beyond PV.

New opportunities arise with the advancement of technologies inside inverters. In fact, it became easier to collect data through sensors that are connected to the PV installations and are managed through cloud systems that link all parts of an installation. Monitoring these developments allows SolarEdge to provide a comprehensive overview of the electricity usage and demand called virtual power plant (VPP) and helps the grid to balance its energy supply. SolarEdge's energy storage and EV charging systems allow a more efficient use of electricity. When demand is high, storage units can be used rather than electricity from the grid, whereas, when demand is low,

[7] Source: Renewable Energy Magazine
[8] Source: Huawei. *How String Inverters Are Changing Solar Management on the Grid*
[9] Source: Lazard (2020). *Levelized Cost of Energy and Levelized Cost of Storage*
[10] Source: IHS PV Inverter Market tracker 2019, analyst estimates

storage units can be refilled and EV can be recharged. The data management of SolarEdge in the residential, commercial, and utility segment has more than 2.7 trillion measurement parameters stored for analysis. Until 2027, the market of VPP is expected to grow on average at 27.2%[11]. SolarEdge signed more than ten agreements with utility players and is integrating VPP capabilities in its PV equipment. Among its competitors, only SMA has also made the move.

A more independent business of SolarEdge is UPS. This division only has a few touching points with SolarEdge's core business. The company is trying to improve its offering of energy backup storage. Furthermore, the recent acquisition of SMRE is outside of SolarEdge's core business, but it gave the company access to the EV market. SolarEdge is exploring possibilities of the integration of its inverter technology into the powertrains.

The most promising business is the energy storage segment that SolarEdge started building organically, but recently boosted through the acquisition of Kokam. The company manufactures innovative battery solutions for various purposes (e.g. UPS, utility-scale storage, and EV). With the factory of Kokam in South Korea, SolarEdge can develop energy storage for specific purposes and increase the efficiency in terms of long cycle life and high-power performance.

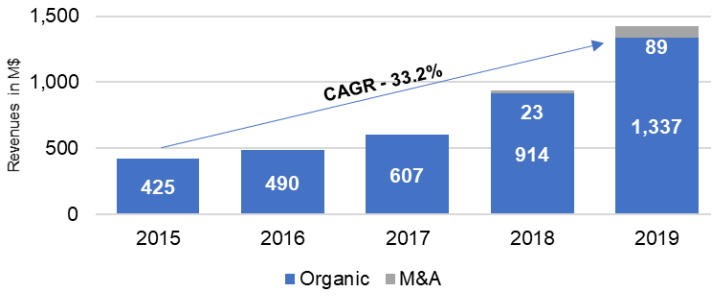
Conclusively said, SolarEdge has wide-ranging capabilities and R&D resources from power circuits to real-time cloud software, mechanics, chemistry (ion cells), electric motor design, etc.. This positioning makes SolarEdge standout from other PV inverter companies in terms of its potential in various other segments.

Forecast

Revenues

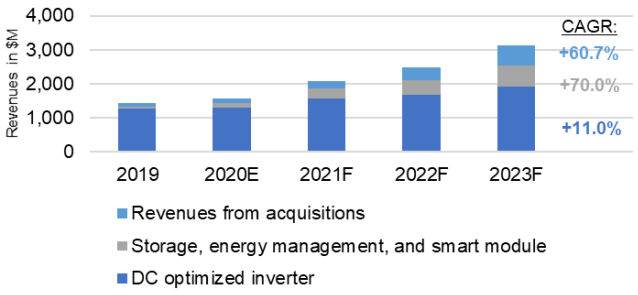
The revenue forecast is fundamental for any DCF model, especially for companies with strong historical growth. Over the past four years, SolarEdge grew organically on average by 33.2% (Exhibit 28). The revenues from M&A are from the recent Gamatronics, Kokam, and SMRE acquisitions. The forecasted growth in revenues from these acquisitions is reflected in exhibit 29, which are expected to grow on average at 60.7% until 2023, far stronger than the inverter business (11%). However, the strongest growth is from PV segments other than the inverter business, which is expected to grow on average by 70% until 2023.

Exhibit 28: SolarEdge revenue, organic vs M&A (in $M)



Source: Company presentation

Exhibit 29: Revenue growth forecast by product (in $M)



Source: Company reports, analyst estimates

[11] Source: Fortune Business Insights

Revenues from acquisitions include revenues from Kokam, SMRE, and Gamatronics. As financial information on these targets is not publicly available, the analysis relied highly on SolarEdge's statements about the acquisitions. Since SolarEdge is planning on leveraging its global network, the acquisitions were weighted into the geographies. Additionally, the expected reduced margins compared to SolarEdge's core business were accounted for (Exhibit 30).

Exhibit 30: Expected profitability of acquisitions

	Target Gross Margin
Kokam	25% by 2022
UPS	30% by 2021
EV	20% by 2023

Source: Analyst day presentation

SolarEdge announced that revenue expectations of Kokam are $300M in 2022 and $500M in 2023, this strong growth in revenues comes from the newly built factory that has massively increased the capacity to produce batteries. After 2023, Kokam is expected to grow with the forecasted market growth for lithium batteries of 18%[12] until 2027 and afterwards with the growth of SolarEdge's core business.

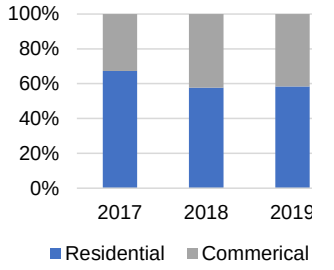
Regarding the UPS (Gamatronics) and EV (SMRE) acquisitions, growth corresponding with the market forecasts until 2027 was assumed, for UPS 10%[13] and for EV powertrains 13.6%[14], afterwards adapting to SolarEdge's growth. The margins were adjusted based on the initial share of the acquisitions of the 2019 M&A revenues.

- GW Shipped Metrics

SolarEdge reports a geographical split of its revenues into the following regions: U.S., Europe, Netherlands, and the rest of the world. For simplification in the data collection process, the Netherlands was merged into Europe. For a more precise forecast of revenues, an overall GW (DC) shipped metrics for each region was established. The metrics was refined by dividing each region into residential and commercial segments (commercial includes utility). The revenue forecast depends highly on the GW shipped metrics that was built for a better overview of revenue streams and expected PV market developments.

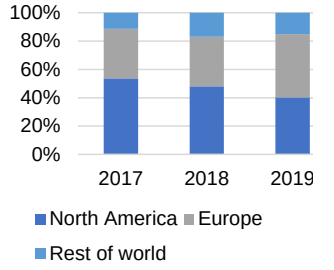
SolarEdge reports its GW shipped to the different regions, as well as towards the different segments. Exhibit 31 shows that SolarEdge is moving towards a more balanced split between segments, like exhibit 32 that shows the share of U.S. shipments decreasing and in the other regions increasing. To identify the segmental split by each region, the market share for the U.S. residential market, reported in the investor presentation was used. For Europe, the 2018 reported 19%[15] share of residential PV installations was applied for determining the split between commercial and residential. Finally, the RoW segmentation was determined by the remaining GW shipped. Exhibit 33 shows the forecasts.

Exhibit 31: GW shipped by segment (in %)



Source: Company report

Exhibit 32: GW shipped by region (in %)



Source: Company report

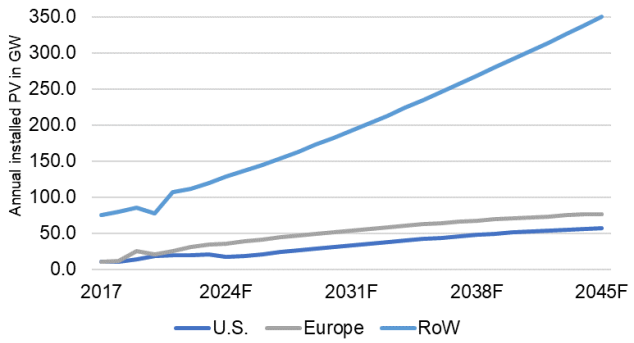
[12] Source: Valuates Reports (2020). *Lithium-ion Battery Market Size*
[13] Source: Markets and Markets (2020). *Modular Uninterruptible Power Supply (UPS) Market*
[14] Source: Grand View Research (2020). *Electric Powertrain Market Size, Share & Trends Analysis Report*
[15] Source: EU Market Outlook for Solar Power

Exhibit 33: GW shipped forecast by region and segment

in GW	2019	2020E	2021F	2022F	2023F	2024F	2025F
United States							
Commercial	0.6	0.9	1.1	1.2	1.4	1.2	1.4
Residential	1.7	1.7	1.8	1.6	2.0	2.2	2.4
Europe							
Commercial	1.3	1.2	1.7	2.3	2.9	3.5	4.2
Residential	1.2	1.0	1.2	1.6	1.7	1.9	2.0
Rest of World							
Commercial	0.4	0.5	0.7	0.9	1.1	1.4	1.8
Residential	0.4	0.5	0.8	0.8	1.0	1.0	1.2

Source: Company report, analyst estimates

Exhibit 34: Forecast of annual PV installations (in GW)



Source: IHS Markit, SEIA, analyst estimates

The commercial segment requires inverters with higher capacity and more optimizers. To account for this discrepancy between segments, a price was calculated per KW for each segment, which includes all inverter and optimizer revenues.

Exhibit 35: Real GDP expectations in 2050

Expected real GDP in 2050	
United States	2.0%
Europe	1.4%
Rest of World*	3.5%

*Calculated based on the following countries Brazil, China, India, Indonesia, Mexico, Russia, and Turkey

Source: PWC, The Economist, Global Security Review, analyst estimates

The annual PV installations by GW in the different regions are used to gain insights on the market sizes and allows to calculate the market share for each region. Until 2025, forecasts from IHS Markit and SEIA were used and then with the corresponding CAGR from 2019 to 2025 (Exhibit 34), the future growth of each region was forecasted by slowly adjusting the growth rate towards the expected future GDP of each region in 2045, which is when maturity is assumed for the PV inverter industry (Exhibit 35). This means that SolarEdge maintains its market share and grows with the market after 2045.

- Market Share Growth

The most difficult task in forecasting the revenues was to estimate SolarEdge's future market share. In the analyst day presentation from November 2019, the management of SolarEdge set forward looking revenue expectations that revenues between the regions U.S., Europe, and RoW would balance. Furthermore, expecting equal revenue streams from all business segments, utility, commercial, and residential. Historical developments confirm these trends as SolarEdge is moving closer towards these targets (e.g. Exhibit 31 & 32). Additionally, the management also stated that its revenue stream expectations coming from its core business, the inverter, would comprise for two thirds of its revenues, while new segments such as energy storage, energy management, and smart module make up for the rest. SolarEdge's inverter is believed to remain its core product in the PV segment and that other products will only be sold as a by-product to the inverter. In order to limit the growth, a market share around 16% was targeted, which is equivalent to Intel's market share [16](company with the largest revenue in its sector, like SolarEdge) in the semiconductors sector that was perceived as comparable (see section capital structure). By applying these limitations to the current market shares and market expectations, it was possible to determine the market shares in each region and segment. The market shares grow until 2030 at a constant rate and then slowly decrease to zero until 2045.

- United States

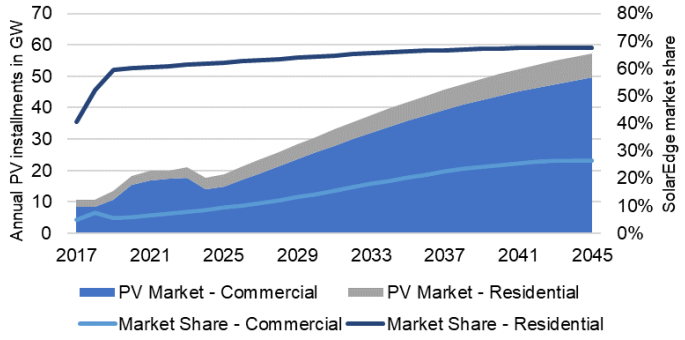
The U.S. PV market is expected to have strong growth in the next three years in the commercial segment, while the residential segment is expected to have the weakest growth among all regions, according to the Solar Energy Industries Association (SEIA). Furthermore, the commercial segment had a record first quarter in 2020, followed by a weak second quarter, due

[16] Source. Statista (2019). *Intel's market share semiconductor revenue worldwide from 2008 to 2019*

to the strong impact of Covid-19 in the U.S.. The high demand in the U.S. leads to an expected growth of 43% [17] in 2020. However, in 2024 the commercial segment is expected to experience a sharp decline of -21%, due to a reduction of subsidies announced by the U.S. government. The market developments are shown in exhibit 36.

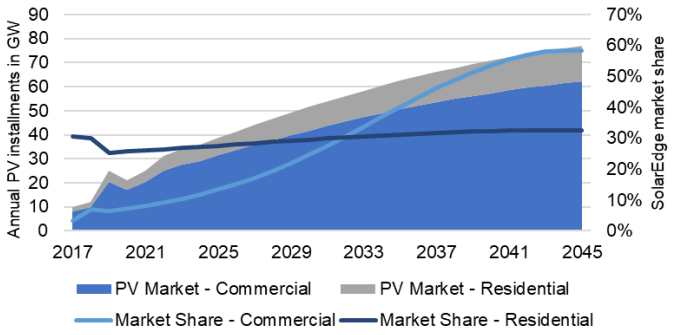
SolarEdge has a strong share in the residential solar market in the U.S. of 59.6% in 2019 (as previously illustrated in exhibit 25). A mature position that, looking ahead, will grow a lot less than in previous years, due to the high trade tariffs that have cut in the profit margins of foreign PV inverter companies in the U.S.. Therefore, forecasting a market share of 67.6% in 2045 (Exhibit 36). In the commercial segment, SolarEdge secured a market share of 5.6% in 2019, which was dragged down by the utility segment. SolarEdge was only involved in a few projects and is not able to maintain its market share for the strong growth in 2020 but is expected to significantly increase in the future. Overall, the revenues in 2019 are strongly driven by SolarEdge's largest distributor Consolidated Electrical Distributors Inc. (CED), which represents 20.4% of the company's revenues and is a key driver of SolarEdge's strategy of outsourcing its production, while maintaining an efficient distribution system across the globe.

Exhibit 36: U.S. market growth vs market share



Source: Company report, analyst estimates

Exhibit 37: Europe market growth vs market share



Source: Company report, analyst estimates

- Europe

For the European market, the market size is more difficult to determine, since in eastern Europe, many PV installations are unlicensed, especially in Ukraine and in Turkey. According to IHS Markit, the European market is expected to grow on average by 7.6% in the next five years. In 2019, Europe achieved a record growth of more than 100% of new PV installations. This strong growth was pushed by the competitive price solar energy has reached and through various green energy agreements made by the EU. However, the strong growth in 2019 was followed by the pandemic, causing new installations to decrease by expected 16%. SolarEdge lost market share in 2019, as it was not able to serve the strong growth. The market developments are shown in exhibit 37.

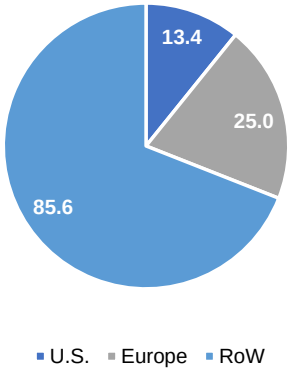
SolarEdge has an expected market share of 13.3% in 2020. In the residential market SolarEdge's share is around 25.4% in 2019. The proximity to Europe is a lot closer than the U.S., which has to do with the production plant in Hungary. Although fighting to sustain its market share in the U.S., the European market has become a large growth opportunity for SolarEdge. Especially in the commercial segment SolarEdge is expected to grow on average by 6.1% until 2045, compared to a 1.8% growth in its residential business.

- Rest of World

The RoW market is by far the largest PV market (Exhibit 38). Especially due to the large

[17] Source: SEIA (2020). *U.S. Solar Market Insight*

Exhibit 38: New PV installations in 2019 (in GW)

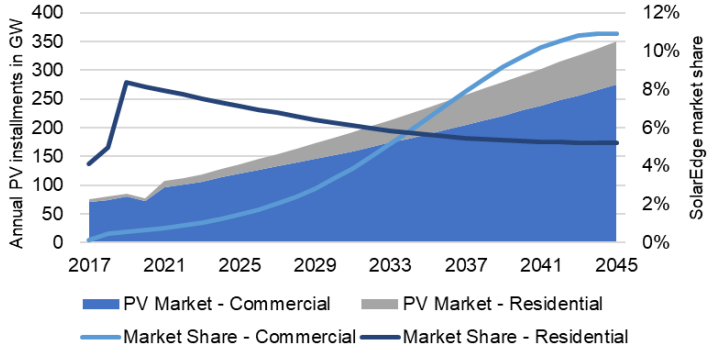


Source: IHS Markit, SEIA

commercial business consisting of 80.8 new installed GW in 2019. However, the market residential segment suffered a 27% decrease in 2020, but quickly recovered and, according to IHS Markit, it is expected to grow at 16.3% in the next five years. Furthermore, government drawbacks of benefitting PV policies have even reduced the expected market growth in the next years. The market is strongly influenced by China that installed 44.1 GW[18] in 2018, which is 51.5% of all RoW installments in the same year.

SolarEdge is expected to have difficulties in maintaining a market share in such a strong growth environment. Therefore, a market share in 2045 of 5.2% was forecasted, as the levels in 2018 (Exhibit 39). With most of its production in Asia, SolarEdge has a good access to the overall strong growing Asian market. Also, through the acquisition of Kokam, the company has gained new customers as well as possibilities for cross-selling its large product portfolio. Overall, revenue growth in Asia is expected to be driven by SolarEdge's commercial business.

Exhibit 39: Europe market growth vs market share



Source: Company report, analyst estimates

[18] Source: PV Magazine